ACCESSION #: 9208120176
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Washington Nuclear Plant - Unit 2 PAGE: 1 OF 9

DOCKET NUMBER: 05000397

TITLE: IMPROPER SRV RESEAT PRESSURE AND REACTOR SCRAM
EVENT DATE: 07/06/92 LER #: 92-033-00 REPORT DATE: 08/05/92

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 2 POWER LEVEL: 016

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(i)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: C SYSTEM: SB COMPONENT: RV MANUFACTURER: C710
REPORTABLE NPRDS: Yes

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

This LER reports on events which occurred on July 6 and 11, 1992. On

these dates, after being manually opened to support Plant testing, Safety/Relief Valve (SRV) MS-RV-3B failed to reseat at the required pressure. The failure to reseat within two minutes on both occasions resulted in manual scrams of the reactor as required by the Plant's Technical Specifications.

Following the July 6th event, a root cause investigation determined that two adjusting rings within the SRV were found set at the wrong positions.

This misadjustment directly impacts the reseat pressure. A solenoid valve in the valve's pneumatic actuator also was found to not stroke freely. The rings were reset, the solenoid valve was replaced, and following additional testing of MS-RV-3B, the Plant was restarted. On July 11th during startup from the July 6th event MS-RV-3B again failed to reseat at the proper pressure. A detailed investigation revealed that the valve disk ring, replaced during valve refurbishment in early 1992, was improperly sized. The required disk ring size was modified in 1979. The Supply System was not notified by the supplier that the spare disk ring, purchased in 1976 and installed in 1992, was not acceptable for use due to modifications made to the SRV design in 1979.

ABSTRACT (Cont'd)

The root cause of the July 6th event was inadequate vendor support of change management in that the supplier failed to notify the Supply System that without the appropriate modification the spare disk rings were no longer acceptable for use The root cause for the improperly adjusted nozzle and adjustment rings was personnel error in that self-checking was

not applied to ensure the proper ring setting were achieved during refurbishment. In addition, the work instructions failed to provide for QC verification of the settings as had previously been Plant practice. The root cause for the failure of the valve to reseat at the proper pressure on July 11, 1992 was Assumed Risk. The preliminary root cause determination completed after the July 6th event concluded that the misadjusted rings in MS-RV-3B, and a sticking solenoid valve in the actuator, were the probable root causes of the failure to reseat at the proper pressure. These probable root causes and associated repairs, in conjunction with the extensive successful testing which had been completed for the valve and actuator, led to the decision to restart. A review has been performed of other SRV spare parts at WNP-2 and the parts have been verified to be acceptable for use in the modified SRV design installed at the Plant. "Self-checking" training will be provided to Maintenance personnel by November 30, 1992.

MS-RV-3B reseated at 940 and 888 psig on July 6 and 11, respectively. These pressures are well within the design limits for WNP-2 but do not meet the valve manufacturers specified reseat range for this model of valve. The temperature transients experienced are not a concern for the Plant. Therefore, these events were not safety significant.

This event posed no threat to the health and safety of either the public or Plant personnel.

END OF ABSTRACT

Plant Conditions

Power Level - 16%

Plant Mode - 2 (Startup)

Event Description

This LER reports on events which occurred on July 6 and 11, 1992. On July 6th during startup from the maintenance and refueling outage, R7, with the Plant at 16% of rated thermal power and a reactor pressure of 950 psig, testing of the safety/relief valve (SRV) Acoustic Monitor System (AMS) was performed. This testing requires that the SRVs be opened remotely to support calibration of the AMS. This testing is generally performed during a Plant shutdown sequence, but was scheduled for performance during Plant startup due to modifications made to the AMS during R7.

Per the test procedure, an attempt was made to manually open SRV MS-RV-3B from the control room. The valve did not respond to the open signal. Five attempts were made to open the valve from the control room without success. After successfully stroking the remaining SRVs from the control room, control of MS-RV-3B was transferred to the Alternate Remote Shutdown Panel (ARSP) and an attempt was made to open it from there. Opening the valve from the ARSP would serve the dual function of completing the AMS testing and limiting the scope of potential control logic which could have caused the failure of the valve to open from the control room. Valve MS-RV-3B opened from the ARSP and AMS testing was performed. However, when an attempt was made to close the valve from the ARSP it would not close. Control of MS-RV-3B was transferred to the control room and an unsuccessful attempt to close the valve was made. Control of the valve was transferred back to the ARSP and another

unsuccessful attempt to close the valve was made. Then, in accordance with the requirements of Technical Specification Action 3.4.2.b for a stuck open SRV, the reactor mode switch was placed in the Shutdown position which initiates a reactor scram.

A reactor scram occurred as expected. Reactor pressure decreased to 940 psig with MS-RV-3B in the open position at which point the valve reseated. Other Plant safety systems responded as expected.

Following the extensive evaluation, repair and testing activities described in the Further Evaluation section below, the Plant was restarted. On July 11, 1992 with the reactor at 14% of rated thermal power and reactor pressure at 950 psig, valve MS-RV-3B was successfully stroked open from the control room. However, the valve could not be closed from the control room. In accordance with the requirements of Technical Specification Action 3.4.2.b for a stuck open SRV, the reactor mode switch was placed in the Shutdown position and the reactor scrammed.

Reactor pressure decreased to 888 psig with MS-RV-3B in the open position at which point the valve reseated. Other Plant safety systems responded as expected.

Immediate Corrective Action

As described above, on both July 6 and 11, 1992 the reactor mode switch was placed in the Shutdown position which resulted in the required reactor scram. The steam relieved through MS-RV-3B caused reactor pressure to decrease to a pressure where the valve reseated.

Further Evaluation and Corrective Action

A. Further Evaluation

Following the July 6, 1992 reactor scram a detailed investigation was performed to determine the reason for the failure of the valve to open from the control room, and the failure of the valve to reseat within the design blowdown range. MS-RV-3B is a Crosby model HB-65-BP dual function relief valve. The valve is designed to be opened remotely via a pneumatic actuator (the relief mode), and mechanically by steam pressure (the safety mode). The relief mode of operation is initiated either manually by a reactor operator or automatically by pressure switches. The relief

mode is used to limit reactor pressure to less than the safety mode setpoints of the SRVs and to provide reactor depressurization capability. This valve was a spare that had been refurbished and installed in the MS-RV-3B location during the recently completed R7 maintenance and refueling outage.

After the Plant shutdown on July 6th, the following actions, in addition to others, were completed:

1. A visual inspection of the valve and actuator externals was performed. No evidence of damage was found.

2. The valve was stroked opened and closed in a controlled manner from the control room. The valve and actuator appeared to stroke smoothly as locally observed.

3. The actuator was disconnected from the valve and stroked twice. The actuator appeared to stroke smoothly.

4. An inspection of the solenoid and plunger from the actuator assembly revealed resistance to plunger movement. Repeated cycling of the plunger resulted in freer movement. This led to the conclusion that the plunger may have initially been stuck which resulted in the valve not opening on the first demand signal. A sticking solenoid could also cause the SRV failure to close. Repeated attempts could have freed the plunger and allowed the pilot valve to function. The solenoid pilot valve was replaced with a tested spare.

5. The valve nozzle ring and adjusting ring were checked for the proper settings (see Figure 1). There are 48 notches on the diameter of the adjustment ring, and the rings are cut at 12 threads per inch. There are thus 576 notches per inch of ring travel. There are 18 notches on the nozzle ring and it is cut at 16 threads per inch for a total of 288 notches per inch of ring travel.

The nozzle ring was found set at -40 notches versus the required -8.

The nozzle ring is initially adjusted flush with the disk ring bottom and then adjusted down away from the disk ring the required number of notches.

The adjusting ring was found set at -350 notches instead of the required -450 notches. The bottom of the adjusting ring is initially aligned even with the bottom of the disk ring and is then

lowered the required number of notches with the result that it slightly overlaps the nozzle ring. The adjusting ring is used to change the reseat pressure for the valve.

The nozzle ring and adjusting ring were reset.

6. The adjusting rings of the three other SRVs refurbished and installed during R7 were inspected and verified to be adjusted to the proper position.

7. Four other SRVs were selected and the solenoid pilot valves were stroked to verify proper operation. This was in addition to the valve stroking performed for AMS testing.

8. Troubleshooting of the electrical circuitry for MS-RV-3B did not reveal any reason for the valve not to have opened from the control room or to have not closed from the control room or the ARSP on demand.

Much of the work described above was witnessed by a Crosby representative.

Complete bench testing of the WNP-2 SRVs is not possible. Setpoint testing of the SRVs is performed by a contracted test facility. However, these facilities test systems do not have the capacity to provide for full lift and subsequent blowdown of the valve to the reseat point. Those facilities that do possess the capacity to test the blowdown of the SRVs are not equipped to test contaminated

valves. Since the complete decontamination of the SRVs is extremely difficult, and since blowdown is a function of the valve design and set pressure, blowdown testing is not performed.

The apparent cause of the valve not opening on demand from the control room was the lack of free movement of the pilot solenoid valve plunger. The plunger apparently was unable to travel full stroke, but finally worked free on the successful attempt to open the valve from the ARSP, the sixth attempted opening.

Prior to the approval for Plant restart on July 9, 1992, it was concluded that the probable root causes for the MS-RV-3B failure on July 6th were the misadjusted nozzle and adjusting rings and the sticking solenoid pilot valve in the actuator. This conclusion was based on the investigation performed, the completion of a preliminary events and causal factors chart, and the results of extensive testing.

Following the July 11th event, a team of personnel was assembled including representatives from General Electric (GE), Crosby, INPO, and the Supply System. This team investigated the repeated failure of MS-RV-3B to reseat at the proper pressure.

As part of the investigation following the July 11th event a review of past changes to the SRV design was made. It was determined from Plant documentation that the disk ring installed during the refurbishment process had not been modified to match those installed in the SRVs during a design change made in 1979.

MS-RV-3B was removed from the Plant. A spare SRV was removed from

the warehouse, disassembled and rebuilt under the observation of the Crosby representative. Both valves were then shipped to a relief valve test facility.

The lift setpoint of the spare SRV was set and the valve was tested for proper setpoint. This valve was then shipped back to the Plant to be installed in place of the valve which had twice failed to reseat at the required pressure.

The failed valve was tested and the lift setpoint was verified to be correct. The valve was then disassembled and inspected. The inspection revealed that the nozzle ring was set at -6.5 notches instead of the required -8. Much more importantly, however, the disk ring diameter was verified to be oversized at 10.110". The required diameter for this part is 10.0875 0.0005". As is apparent from the tight tolerance restrictions, this dimension is critical in that it controls the flow of steam to areas above the disk holder and disk ring. The effect of reduced pressure above the disk ring on valve reseating performance during testing appears to be exaggerated at low steam pressures (less than the 1185 psig set pressure) due to the resultant reduced valve backpressure.

The SRVs were supplied by GE as part of the Nuclear Steam Supply System. The new disk ring was purchased from GE in 1976 as part of a spare parts order for the SRVs. In 1979 GE notified the Supply System that the SRVs needed to be modified. The modifications to the SRVs were performed in 1979-1980. These modifications were supplied by GE and performed by Crosby. In 1981 GE notified the

Supply System that certain spare parts previously purchased for the SRVs should be returned for replacement since they were not acceptable for use in the modified SRVs. This notification did not include the disk ring. The Supply System was not provided, at that time, with the dimensional information necessary to perform this type of evaluation. The spare disk rings remained in stock for use in the modified SRVs. The first of these disk rings used was the one installed in the valve placed into service at the MS-RV-3B location. The remaining unused disk rings have now been hold-tagged in the Supply System warehouse to preclude potential future use without the required modification being made.

The root cause for the failure of MS-RV-3B to reseat at the required pressure on July 6, 1992 was inadequate vendor support of change management. The vendor, in this case GE, the supplier of SRV spare parts, failed to notify the Supply System that without the appropriate modification the spare disk rings were no longer acceptable for use.

The root cause for the misadjusted nozzle and adjusting rings prior to the July 6th event was a personnel error in that self-checking was not applied to ensure the proper setting was achieved. In addition, the valve rebuild work instructions failed to provide for QC verification of the ring settings as had previously been Plant practice. This lack of identifying the appropriate QC inspection will be addressed through Problem Evaluation Request 292-867. As described above, the three other SRVs refurbished in 1992 were checked after the July 6th event and the rings were verified to be properly adjusted.

The root cause for the failure of the valve to reseat at the proper pressure on July 11, 1992 was Assumed Risk. The preliminary root cause determination completed after the July 6th event concluded that the misadjusted rings in MS-RV-3B, and a sticking solenoid valve in the actuator, were the probable root causes of the failure to reseat at the proper pressure. These probable root causes and associated repairs, the extensive successful testing which had been completed for the valve and actuator, and the knowledge that reseat testing of the valve outside the Plant was not possible, led to the decision to restart. As a precaution, procedural instructions were provided to aide the Operations personnel in the unlikely event the valve should fail to reseat at the proper pressure when retested at 950 psig.

The reactor scrams on July 6 and 11, 1992 were shutdowns required by the Plant Technical Specifications. These events are reportable pursuant to the requirements of 10CFR50.73(a)(2)(i)(A). NRC verbal notification of these events was made on July 6 and 11, 1992 per the requirements of 10CFR50.72(b)(1)(i)(A).

There were no structures, systems, or components inoperable prior to the start of this event that contributed to the event.

B. Further Corrective Action

The Supply System has inspected the SRV spare parts and verified that the remaining parts are acceptable for use in the modified SRV design. GE has been involved in the investigation and resolution of

these events and is thus aware of the spare parts concern.

As described in Supply System response to Notice of Violation dated July 10, 1992, "self-checking" training will be provided to all the Maintenance Shop personnel. This training will be completed by November 30, 1992.

Safety Significance

The SRVs are used to limit the pressure within the reactor vessel. The SRVs relieve steam to the suppression pool. The SRVs open either mechanically due to high steam pressure, or pneumatically due to: 1) manual initiation; 2) high pressure as sensed by a pressure switch; or 3) actuation of the Automatic Depressurization System (ADS) when reactor inventory is not being adequately maintained and one of the low pressure injection sources is available to inject water. ADS actuates seven SRVs but MS-RV-3B is not one of the seven.

In addition, when the SRVs are manually opened to control reactor pressure they are generally opened one at a time and in a specific order to distribute the discharged steam energy somewhat evenly around the suppression pool. Manual opening as defined by the Emergency Operating Procedure Flow Charts call for the sequential opening, as required to control reactor pressure, of each of the 18 SRVs. MS-RV-3B is the seventeenth of the eighteen valves called for. MS-RV-3B would thus not be used during most transients unless the condenser were unavailable for an extended period of time and the suppression pool had to be used as the heat sink.

As demonstrated during these two events, the SRV would reseat even with the wrong size disk ring installed. It did, however, reseat at a lower than desired pressure. The lowest pressure observed, 888 psig, is lower than desired but is well within the design and safety limits of the Plant. In fact, when the reactor pressure is controlled using the SRVs the pressure is maintained between 800 and 1000 psig. The saturation temperature change associated with a pressure change from 1185 psig, the MS-RV-3B safety setpoint, to 888 psig is approximately 36 degrees F. This temperature change is within the 100 degrees F per hour cooldown limit for the Plant. Since this is a rapid pressure change which would be terminated when the SRV closes, it is not expected that the reactor vessel metal would experience the full 36 degrees F change. The small temperature and pressure change caused by the failure of the SRV to reseat at the proper pressure thus had no safety significance.

Similar Events

There are no past instances at WNP-2 where an SRV has failed to reseat at the proper pressure.

EIIS Information

Text Reference EIIS Reference
System Component

Safety/Relief Valve (SRV) SB RV
MS-RV-3B SB RV
Acoustic Monitor System (AMS) SB --
Alternate Remote Shutdown Panel

(ARSP) -- --
Reactor Mode Switch JC HS
Automatic Depressurization System
(ADS) SB --
High Pressure Core Spray System BG --

Figure 1 "Improper SRV Reseat Pressure and Reactor Scram" omitted.

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

P.O. Box 968 o 3000 George Washington Way o Richland, Washington 99352

August 5, 1992
G02-92-187

Docket No. 50-397

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

SUBJECT: NUCLEAR PLANT WNP-2, OPERATING LICENSE NPF-21
LICENSEE EVENT REPORT NO. 92-033

Transmitted herewith is Licensee Event Report No. 92-033 for the WNP-2 Plant. This report is submitted in response to the report requirements

of 10CFR50.73 and discusses the items of reportability, corrective action taken, and action taken to preclude recurrence.

Sincerely,

J. W. Baker
WNP-2 Plant Manager (Mail Drop 927M)

JWB/DAS/jrd
Enclosure

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